

1       Claims

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3       1. A process for preparing a particulate solid  
4       material comprising the steps of:  
5           (a) obtaining a paper-fibre waste solid material  
6           having a ratio of china clay, or equivalent, to  
7           chalk, or equivalent, greater than a pre-determined  
8           minimum;  
9           (b) treating the material to reduce the moisture  
10          content and form a granular material; and  
11          (c) calcining the granular material at a temperature  
12          of approximately 1300°C or higher to provide a  
13          particulate, 100% solids, material.

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15       2. A process as claimed in claim 1 wherein the  
16       paper-fibre waste solid material is non-hazardous  
17       waste material arising from the recycling of waste  
18       paper and tissue.

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20       3. A process as claimed in claim 2 wherein the  
21       paper-fibre waste solid material is in the form of  
22       sludge.

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24       4. A process as claimed in any one of the preceding  
25       claims wherein the paper-fibre waste solid material  
26       has a moisture content of over 45%.

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28       5. A process as claimed in claim 4 wherein the  
29       paper-fibre waste solid material has a moisture  
30       content of over 55%, optionally 60%.

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1       6. A process as claimed in any one of the preceding  
2       claims wherein minor components in the paper-fibre  
3       waste solid material including non-fibrous  
4       contraries materials are removed prior to step (b).

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6       7. A process as claimed in any one of the preceding  
7       claims wherein the paper-fibre waste solid material  
8       is waste paper from a paper making process.

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10      8. A process as claimed in any one of the preceding  
11      claims wherein the china clay or equivalent includes  
12      any form of hydrated aluminium silicate, including  
13      kandites, kaolins and the like.

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15      9. A process as claimed in any one of the preceding  
16      claims wherein the chalk or equivalent includes any  
17      form of calcium carbonate, which includes the forms  
18      of limestone.

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20      10. A process as claimed in any one of the preceding  
21      claims wherein the process further includes the step  
22      of:

23      dewatering the paper-fibre waste solid material  
24      prior to step (b).

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26      11. A process as claimed in claim 10 wherein the  
27      dewatering process provides a sludge material having  
28      a solids content generally in the range 22-55%.

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30      12. A process as claimed in claim 10 or claim 11  
31      wherein analysis of the china clay:chalk ratio is

1       carried out prior to the dewatering of the waste  
2       material.

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4       13. A process as claimed in any one of the preceding  
5       claims wherein the determination of the ratio of the  
6       china clay:chalk is carried out using the 'acid  
7       extraction' method.

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9       14. A process as claimed in claim 13 wherein the  
10      pre-determined minimum ratio using the "acid  
11      extraction" method is approximately 0.2.

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13      15. A process as claimed in any one of claims 1 to 12  
14      wherein the determination of the ratio of the china  
15      clay:chalk is carried out using the "ash/acid  
16      extraction" method.

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18      16. A process as claimed in claim 15 wherein the  
19      pre-determined minimum ratio using the "ash/acid-  
20      extraction" method is approximately 0.13.

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22      17. A process as claimed in any one of the preceding  
23      claims wherein a conditioning material is added to  
24      the paper-fibre waste solid material in step (a).

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26      18. A process as claimed in claim 17 wherein the  
27      conditioning agent raises the china clay:chalk ratio  
28      above the pre-determined minimum.

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30      19. A process as claimed in claim 17 or claim 18  
31      wherein the conditioning material is partly,

1       substantially or wholly china clay, or at a china  
2       clay suspension, or another silicate material.

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4       20. A process as claimed in any one of claims 17 to  
5       19 wherein a dispersing agent is added with the  
6       conditioning agent.

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8       21. A process as claimed in any one of claims 17 to  
9       20 wherein the material has a solids content of less  
10      than 45%, optionally 22% or lower.

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12      22. A process as claimed in any one of the preceding  
13      claims wherein the ratio of silica and aluminium to  
14      natural fillers in the paper-fibre waste solid  
15      material is also determined.

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17      23. A process as claimed in any one of the preceding  
18      claims wherein the treatment step (b) includes  
19      compression and/or extrusion of the material.

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21      24. A process as claimed in Claim 23 wherein step  
22      (b) is carried out by a granulating press.

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24      25. A process as claimed in any one of the preceding  
25      claims wherein the treatment step (b) is provided by  
26      direct heat contact.

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28      26. A process as claimed in claim 25 wherein a heat  
29      transfer material is used.

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1       27. A process as claimed in any one of the preceding  
2       claims wherein the treatment step (b) is carried out  
3       with agitation.

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5       28. A process as claimed in claim 27 wherein the  
6       agitation is provided by a rotary apparatus.

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8       29. A process as claimed in claim 28 wherein the  
9       rotary apparatus is inclined.

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11      30. A process as claimed in claim 28 or claim 29  
12      wherein the rotary apparatus allows for a wholly or  
13      substantially continuous feed of material.

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15      31. A process as claimed in any one of the preceding  
16      claims wherein the treatment step (b) is carried out  
17      at a raised temperature, optionally between 60-80°C.

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19      32. A process as claimed in any one of the preceding  
20      claims wherein step (b) is carried out under an  
21      inert atmosphere.

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23      33. A process as claimed in any one of the preceding  
24      claims wherein the granular material provided by  
25      step (b) comprises granules in the range 3mm-30mm in  
26      size.

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28      34. A process as claimed in any one of the preceding  
29      claims wherein the granular material formed by step  
30      (b) is reduced in size, optionally by grinding or  
31      milling.

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1       35. A process as claimed in any one of the preceding  
2       claims wherein the granular material formed by the  
3       treatment step (b) has a solids content in the range  
4       of approximately 45-90% solids.

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6       36. A process as claimed in any one of the preceding  
7       claims wherein the calcining of the granular  
8       material reduces the moisture in the material wholly  
9       or substantially to zero.

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11      37. A process as claimed in any one of the preceding  
12      claims wherein particulate material being formed by  
13      step (c) is partly or substantially porous.

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15      38. A process as claimed in any one of the preceding  
16      claims wherein the granular material is calcined  
17      with agitation.

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19      39. A process as claimed in claim 38 wherein the  
20      agitation is provided by a rotary apparatus.

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22      40. A process as claimed in claim 39 wherein the  
23      rotary apparatus is a high temperature rotary  
24      furnace tube.

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26      41. A process as claimed in any one of the preceding  
27      claims wherein the calcining temperature is greater  
28      than 1300°C, optionally approximately 1320°C, or  
29      optionally higher.

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1       42. A particulate solid material whenever prepared  
2       by a process as defined in any one of claims 1 to  
3       41.

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5       43. A particulate solid material formed from a  
6       paper-fibre waste solid material having a bulk  
7       density of less than 1,000kg/m<sup>3</sup>, preferably in the  
8       range 560kg/m<sup>3</sup> to 800kg/m<sup>3</sup>, and in the form of an  
9       aggregate having a mean particle size in the range 3  
10      to 15mm.

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12      44. A particulate solid material as claimed in claim  
13      42 or claim 42 being a light-weight aggregate for  
14      making cementitious, concrete or other building  
15      blocks.

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17      45. A particulate solid material as claimed in claim  
18      42 or claim 43 having a particle size of less than  
19      100µm, and being a cementitious material.